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UNCLASSIFIED- SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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PLEASE NOTE

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I. GENERAL

First Results of Soviet Investigations Under the IGY

A very short summary of the results of investigations conducted by Soviet scientists according to the IGY program is given by Valeriya Alekseyevna Troitskaya, Candidate of Physicomathematical Sciences, scientific secretary of the Interdepartmental Committee for the Conduct of the IGY.

The information in the article entitled, "First Results," presents highlights in the various fields of investigation.

The principal field of geophysics in which Troitskaya works is the Earth's electromagnetic field and, in particular, the study of Earth currents. She reports that one of the most important discoveries of the first months of the IGY is the establishment of the fact that the structure of the Earth's magnetic field in the upper layers of the atmosphere differs from what was assumed up to this time. This stems directly from the observed discrepancy of the geomagnetic parallels from the lines of equal intensity of cosmic radiation. This discovery was made during the study of the distribution of cosmic radiation, according to latitude and longitude, from airplanes and then confirmed by the first results of investigations of cosmic radiation by the artificial earth satellites.

Troitskaya also mentions that the first part of the work of the Pacific Ocean Expedition, which is conducting a study of the structure of the ocean bottom in the Kurile-Kamchatka region with deep seismic sounding, has been completed. (Nauka i Zhizn', No 5, May 58, pp 26-27)

Soviet IGY Bibliography Compiled

Mezhdunarodnyy Geofizicheskiy God (International Geophysical Year), by R. F. Zagrutina, is a bibliographic index of literature in the Russian language for 1954-1957, which was printed by the Publishing House of the Academy of Sciences USSR, Moscow, 1958, and is issued by the Interdepartmental Committee for the Conduct of the International Geophysical Year under the Presidium of the Academy of Sciences USSR. (Knizhnaya Letopis', No 24, 1958)

Size Halved in New Soviet Turbodrill

A new turbodrill created by the All Union Scientific Research Institute of Drilling Techniques has been successfully tested in the Piryatin petroleum deposits.

The new drill has a diameter of 4 inches which is half that of turbodrills now being produced in series. It can develop almost twice as large a load on its chisel and has a mechanical drilling speed one third higher than the usual speeds.

The principal advantage of the drill is that it makes it possible to bore holes of smaller diameter, which results in a considerable saving in use of metal pipe and other materials. (Moscow, Izvestiya, 4 Jun 58)

Soviet Geologists Leave for Korea

A group of geologists, associates of the Far East Affiliate of the Academy of Sciences USSR, left Vladivostok for Korea on 9 June. The group will be part of the complement of a Soviet-Korean geological detachment which will conduct prospecting operations for useful minerals. (Moscow, Izvestiya, 10 Jun 58)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Fedorov Discusses Results of Rocket and Satellite Investigations and Future Manned Cosmic Flights

Ye. K. Fedorov, corresponding member of the Academy of Sciences and member of the Soviet IGY Committee, in the article, "With the Aid of Rockets and Artificial Earth Satellites," considers at length the results of investigations conducted with these instruments.

In discussing man's flight into outer space, Fedorov again reviews the results of the Laika experiment on Sputnik II, in which the animal's general condition was judged satisfactory throughout the experiment. While this was quite important and encouraging for planning the flight of man into outer space, physiologists consider it necessary to conduct repeated and more detailed experiments on animals before undertaking a flight by man.

"What are the prospects of work by Soviet scientists in studying the upper layers of the atmosphere and cosmic space?"

Federov states that investigations by rockets and artificial earth satellites will be continued in accordance with the IGY program. Interesting results have been obtained in recent months during the launching of meteorological rockets on Heiss Island, Franz Josef Land, and in the Antarctic from the Soviet ship Ob'.

The launching of satellites will be continued, but as they are not standard items but a continuously elaborated design based on the experience of previously launched satellites, the dates of their launching cannot be determined in advance.

Satellites of various types, will be designed, both for prolonged and relatively short operation, traveling around the Earth along distant and near orbits.

"The Soviet Union has launching vehicles and systems for guiding them which make it possible to launch confidently various types of satellites.

"The future opens the interesting prospect of the escape of man into outer space -- an epoch foreseen by K. E. Tsiolkovskiy.

"A number of scientific and technical problems await solution here."

One of these, continues Fedorov, the final working out of methods of landing a satellite on the Earth's surface is a very important one. It can be solved in two ways: the first, deceleration with the aid of a jet engine, is probably the only possible for landings on the Moon and other planets devoid of atmosphere. This will require the preservation of a large amount of fuel for the return trip and, consequently, a large increase in the payload of the rocket launching the satellite or spaceship.

Another way is deceleration in the air (the so-called braking ellipses), making use of friction while crossing the atmosphere. This is how it is possible to land on the Earth and planets having an atmosphere. Many intricate problems for such a method must be overcome. Perhaps the solution will be found in the form of a glider which consecutively "dives" into the atmosphere and again soars over it to dissipate the heat gained.

Of great importance is the task of obtaining electric energy for equipment installed on a satellite through solar batteries. Such batteries exist at present but have such a small capacity that it is only sufficient for supplying a very small radio transmitter. The solution of this problem will enable scientists and engineers to use satellites widely for many scientific and practical purposes, as for example, world-wide transmission of television programs, for setting up astronomical observatories beyond the atmosphere, and for the observation of meteorological processes.

Next in turn are the problems of sending instrumented rockets at great distances from the Earth to investigate the physical properties of interplanetary space, and then for studying the Moon and those planets nearest the Earth.

"It will be necessary to increase considerably the power spent on launching rockets carrying a set of instruments and means of radio communication into outer space. The solution of such a problem will require very great efforts.

"There is no doubt that all of these and many other still more complex problems will be solved. The launchings of large satellites in the USSR have paved a clear road into cosmic space. The launching of satellites is the result and one of the indicators of the regular advance of the level of Soviet science and technology and of the might of Soviet industry. As time passes, there will be more of such indications, both in the USSR and in the other countries of the socialist camp." (Nauka i Zhizn, No 5, May 58, pp 11-16)

Wind Studies on Supersonic Flight and Guidance

Among the scientific reports heard at the session of Departments of the Academy of Sciences USSR, which opened in Moscow on 16 June, were those by G. I. Petrov, corresponding member of the Academy of Sciences USSR, and V. S. Pugachev, doctor of technical sciences.

Petrov, in his report, "The Motion of a Real Gas With a Velocity Substantially Exceeding the Speed of Sound," spoke on certain peculiarities of the motion of a gas at its highest velocities and answered a number of questions connected with the aerodynamic heating of bodies. Experimental investigations in this field are necessary for the correct designing of different apparatus -- rockets and airplanes flying at velocities exceeding the speed of sound.

Pugachev's report was entitled, "New Methods of Determining Optimal Systems for Acquiring and Reproducing Signals in the Presence of Noise."
(Moscow, Pravda, 17 Jun 58)

Satellites in the Study of the Earth

Ye. Fedorov, corresponding member of the Academy of Sciences USSR, writing in an article entitled, "The Satellite Studies the Earth," remarks that Sputnik III, with good reason, is called "the flying laboratory." The numerous instruments with which it is equipped make it possible to widen considerably the investigations of physical phenomenae which occur in cosmic space and the properties of the upper layers of the atmosphere.

In a comparison of the satellites launched up to this time, Fedorov states that each satellite, in addition to radio transmitters, carried one or more measuring instruments. In Sputnik I, instruments determined the temperature inside it and the pressure of the gas filling it. That is to say, they reported on the "climate" which existed in the satellite while in flight. These observations were important, first of all in that they indicated under what conditions instruments in succeeding satellites would be required to operate. The second US satellite carried similar instrumentation.

Sputnik III carried instruments for measuring the intensity of cosmic rays and short wave ultraviolet and Roentgen radiations of the Sun. In addition to this, a considerable part of its scientific program consisted of the unique biological experiment with the first living creature sent into cosmic space.

[illegible] second and third US satellites (Explorer I and III), instruments for measuring the intensity of cosmic rays and for evaluating the [illegible] of the flow of micrometeors were carried.

The scientific program being realized by Sputnik III, both as to extent and detail, greatly surpasses the problems set before Sputnik I and II.

Completely new, in comparison with the investigations conducted with the US and the first two Soviet satellites, is the direct measurement of certain atmospheric characteristics: the composition of ionized gases in the upper layers of the atmosphere, the concentration of positive ions, and the pressure of the air. These data can only be obtained with the aid of satellites. They are very important for the calculation of trajectories and the regime of the flight of rockets and future cosmic ships in the atmosphere and for maintaining radio communication with them.

Among the many problems which add to the difficulty of obtaining accurate measurements of the pressure and other characteristics of the atmosphere are the "tumbling" of a satellite during flight, which makes it necessary to orient properly the openings of the manometers and other instruments connected with the outer medium, whether they are directed on the moving side of the satellite or not. Under the influence of the ultraviolet radiation of the Sun and for other reasons, the surface of the satellite acquires an electrical charge which can distort the readings of instruments.

The high vacuum, where the satellite moves, is conducive to the liberation of gasses by its metals which can also distort the true picture of the composition of the upper atmosphere. Therefore, a special material is selected for covering its surface to keep the liberation of gases at a minimum.

There are many other reasons which disturb the proper operations of the apparatus of a satellite, each of which must, in a greater or lesser degree, be eliminated.

The creation and successful launching of a large, automatically operating observation station into the limits of the atmosphere represents, says Fedorov, the appearance of a new method in geophysics.

The basic characteristic of geophysical process consists in this, that they develop in all of the space of the Earth or in a considerable part of its territory and continuously change their state. For example, the basic meteorological formations determining the nature of the weather -- the atmospheric fronts, the cyclones, zones of precipitation, etc. -- have an extent of several hundred to several thousand kilometers.

To present the state of any geophysical phenomenon at a given moment and to follow its development -- and this is important for the solution of a number of the daily problems of science and practice -- it is necessary to have a whole network of observation stations over the whole of the Earth's surface. The present number of such stations is in the tens of thousands.

The new possibilities opened by great satellite laboratories will be more vividly shown with the formation of modern weather-service organizations, into whose operations satellites can be introduced.

At present, the making of a rapid analysis of meteorological conditions and arrival at a forecast, is a complex and laborious task, requiring the collection and extension of data obtained in many observation stations. The more detailed the forecast, the more dense a network of stations is required. Yet the number of these stations is still not enough, as can be seen from their absence in large ocean areas.

The satellite observatory principally opens up another way of determining the conditions and the analysis of geophysical processes. A comparatively small number of such automatic observatories continuously flying around the Earth can at first fully supplement the ground stations, and in the future replace them to a considerable degree.

At present, meteorologists base their opinions on the data of several thousand ground stations and those of several hundred points conducting radiosonde observations. Thus an over-all presentation of atmospheric processes is made from observations underneath, that is from the bottom of the ocean of air.

It is possible to obtain the necessary data for the study of atmospheric phenomena from above, looking down on the surface of the atmosphere. However, the solution of several complex problems still remains. For example, furnishing a long-lived satellite and its apparatus with the necessary power for the transmission of a considerable amount of information, including television pictures.

Several types of observations, for example, of cloudiness, could at present already be done better by television than is done by the existing network of ground stations. A map of the cloud distribution over a large territory, which at present is the summary of hundreds and thousands of readings made by ground stations could be instantly given by a satellite equipped with a television transmitter. Using a satellite, it is also possible to obtain data concerning the temperature of the Earth's surface and of the wind. For this, states Fedorov, it is necessary to develop new methods of measuring.

The speed of a satellite's motion and the availability of its "surveys" of considerable areas of the Earth would permit the use of five to six simultaneously operating laboratories flying around the Earth, which could almost continuously inform meteorologists on the state of the atmosphere.

"This glance into the possibly not-too-distant future meteorological investigations is only an example of how many important problems connected with the study of the Earth and its atmosphere can be solved with the aid of satellites. It is difficult to overestimate the value of satellites for geophysics and many other sciences." (Moscow, Izvestiya, 8 Jun 58)

Photograph of Sputnik II Radio Transmitter

A photograph showing the parts of the radio transmitter used in Sputnik II appeared in the 11 January issue of the Soviet newspaper Sovetskaya Aviatsiya. (Moscow, Sovetskaya Aviatskaya, 11 Jan 58)

Rocket and Satellite Apparatus

The photographs and descriptions of three items of use in the field of rocket and artificial earth satellite investigations appeared in a Soviet newspaper shortly after the launching of Sputnik I.

The first of these is a 5.5-power telescope of simplest design (details for the construction of which the article states previously appeared in print) for visual observations of a satellite. The telescope is described as having a lens with a diameter of 51 millimeters and a field of vision of 12 degrees.

The second is a movie camera "for an earth satellite." Of interest to science, in addition to showing how the Earth looks "at 900 kilometers," are the physical conditions inside a satellite -- the temperature, pressure, the possible loss of the hermetic seal, etc. It is very important to systematically photograph all of instruments showing this. "That is why the heavier satellites will be equipped with a movie camera, together with other instruments."

The principal difference of the photographic apparatus for rockets and satellites from the usual is their resistance to the enormous overloading acting on the instruments at the moment of launching, and their capability of operating under sharp temperature fluctuations. According to the article the camera discussed is capable of withstanding an accelerating force equal to 200 times that of gravity. The film speed can be regulated within the limits of from 16 to 200 frames per second. The camera is automatically controlled.

The third item is an atomic battery the size of a button. This battery uses the energy of the decay of radioactive promethium -147 oxide atoms. Beta-radiations (flow of electrons) arising in the radioactive decay act on the particles of phosphor powders, and the energy of the atoms is converted into red and infrared rays. These rays are then picked up by two photoelements in the battery, which convert the light visible and the infrared rays into electrical current.

In contrast to other sources of electrical energy, the atomic battery is capable of giving a steady flow for 5 years. It operates under extremely unfavorable conditions. For example, at temperatures as low as -130 degrees centigrade, the voltage and power of the source even increases. In temperatures near +100 degrees centigrade, the power of the element decreases insignificantly.

CPYRGHT CPYRGHT "At present, the new source of energy is not widely used, as it is very expensive. It is said that in the future, the atomic battery will find application in the manufacture of miniature radio devices for high-altitude rockets and artificial earth satellites." (Moscow, Sovetskaya Aviatsiya, 10 Oct 57)

Soviet Book on Astronautics

Mechte Navstrechu (Toward a Dream), by B. Lyapunov, takes for its theme the science of astronautics. Lyapunov describes, on the basis of previous Soviet scientific achievements (although the book was written before the launching of Sputnik I and II), the further stages of the conquest of space: permanent artificial earth satellites, which he visualizes as intercosmic stations; manned flights to the Moon and its conquest; the visits to the nearest (at first) and then to the most distant planets of the solar system; and, finally, the journey to the planets of another system.

The author's merits lie in his ability to popularize the achievements of modern science, and he does this in a lively and interesting manner. CPYRGHT CPYRGHT Woven into the book, besides astronautics, are other fields of science -- atomic energy and cybernetics, since at present, none of the sciences can exist and develop in isolation. CPYRGHT "For the conquest of interplanetary space, it is necessary to use all the modern achievements of science and technology." The author especially succeeds in describing the flight of a rocket ship, maps of cosmic space, and planetary landscapes.

The book is said to be of interest, and especially so for young readers. (Znaniye-sila, No 4, Apr 58, p 43)

Long Range Forecasts Based on Cyclonic and Anticyclonic Processes

Utilization of Certain Peculiarities of Atmospheric Processes for Long Range Forecasts, 295-page illustrated book, by N. A. Belinskiy, was published by Gidrometeoizdat, Leningrad, in 1957.

The connection between variations of solar activity and certain processes in the atmosphere and hydrosphere are studied. The data of the cyclonic and anitcyclonic activity of the northern hemisphere from 1900 to 1939 are processed. The author notes that the tendency toward the establishment of direct relationships between the variation of hydrodynamic elements and solar activity is not methodically justified. Cyclonic and anticyclonic activity is most closely connected with solar activity, in particular with its secular variations and its 11-year cycles. The development of cyclonic activity is accompanied by the inflow of heat and anticyclonic activity, by the loss of heat. On the whole, over the hemisphere, a strengthening of cyclonic and a weakening of anticyclonic activity is observed with an increase of solar activity. The biennial cyclonic oscillation of these elements, which was also observed, has a clearly atmospheric origin and is not connected with solar activity. Investigation of the redistribution of the mass of air on the Earth showed that in the average several-year profile from hemisphere to hemisphere, $3,87 \times 10^{-12}$ tons of air were transferred, while the direction of flow fluctuated. This air was centered on the whole over Eurasia, North Africa, and the northern part of the Indian Ocean.

The mechanism examined may be used for hydrological forecasts made much in advance. The prognostic relationship of the temperature of the waters in the Atlantic Ocean in the warm part of the year to the temperature of the air and the cyclonic and anticyclonic activity in the cold part of the year is established. These relationships show that anomalies of water temperatures arising in winter remained almost unchanged in the warm time of the year.

The following hypothesis is put forward. Beginning with 1930, the cyclonic activity and zonal movement in the atmosphere was strengthened with the increase in solar activity. This led to a lessening of meridional movements, a weakening of monsoon circulation, and a weakening of the exchange of air and moisture between the hemispheres. As a result of this, the temperature of the water and air in the upper latitudes of the northern hemisphere increased, the iciness of arctic seas and the flow of many rivers decreased, and the level of the Caspian Sea and other lakes was lowered.

The author proposes in long-range forecasts of the water yield of rivers, to establish the connection with cyclonic and anticylonic activity and not directly with solar activity. With such a construction of relationships, it was found possible to give forecasts of the water yield of the Don, the Volga, the Danube, the Northern Dvina, the Dnieper, and the Ural 4 to 6 years in advance. (Referativnyy Zhurnal, Geofizika, No 2, Feb 58, Abstract No 1372, by A. S. Sarkisyan)

New Method of Measuring Radiation Balance

In "A New Method of Measuring Radiation Balance," by B. A. Ayzenshtat, which appeared in Trudy Tashkentskoy Geofizicheskoy Observatorii, No 13, pp 122-132, a thermoelectric balance meter with heliocompensation, which is proposed by the author, is described. In this instrument, the effect of the wind on instrument readings is almost wholly eliminated.

The principle of heliocompensation is described as follows: the upper sensing plate is sheltered by a semitransparent screen, which lessens the reception of solar radiation to such a degree that the temperature of the upper and lower sensing plates is equal (this condition is secured according to the absence of current in the galvanometer adjoining the balance meter). The latter can be determined if the full flow of solar radiation in a horizontal surface is measured and the coefficient characterizing the portion of solar radiation arrested by the screen. The determination of radiation balance with such a method -- the graduation of the systems of the balance meter -- the galvanometer, is not needed, however, it is necessary that the sensitivity of both sensing plates be equal.

The described instrument can be utilized only on days with a positive radiation balance and during conditions when the Sun is not covered by middle and lower level clouds.

A segmented shield, rotated by an electric motor, is used in the nature of a semitransparent screen. Special laboratory research showed that with a variation of the velocity of blowing on the instrument from 0 up to 6.5 meters per second, the readings did not depend on the wind velocity. Field testing showed matching results for measurements obtained according to the heliocompensation method and the usual method. (Referativnyy Zhurnal Geofizika, No 2, Feb 58, Abstract No 1162, by K. Ya. Kondrat'yev)

1955 Measurements of Cosmic Showers Reported

An article, "An Investigation of Wide Atmospheric Showers of Cosmic Radiation," by O. Dobzhenko, V. Zatsepin, Ye. Murzina, S. Nikol'skiy, I. Rakobol'skaya, and Ye. Tukish, give the following information:

In the fall of 1955, the energies of approximately 10,000 wide atmospheric showers of cosmic rays were measured at an altitude of 3,860 meters above sea level.

The wide atmospheric showers produced by elementary particles with energies of $2 \cdot 10^{13}$ - 10^{16} electron volts were detected by quadruple coincidences of discharges recorded in two groups of counters about 2 meters apart. To determine the point of passage of the axis and the number of charged particles in each recorded shower, 33 groups of hodoscopic counter devices were used, which were connected with the GK-7 hodoscopic instrument devised by L. N. Korablev (Pribory i Tekhnika Eksperimenta, No 2, 1956, 54). Each group contained 24 counters covering and area of 100 square centimeters. An additional 108 hodoscopic counters covering an area of 330 square centimeters and 72 counters covering an area of 22 square centimeters each were arranged at three points, the apices of a triangle, 19 meters from the center of the hodoscopic instrument.

When the body of a wide atmospheric shower passed within the area covered by the instrument, the axis of the shower was located with an accuracy of one meter -- assuming axial symmetry for the shower (Doklady Akademii Nauk SSSR, 93, 133, 1956). The error in the determination of the total number of particles in showers with axes not more than 5 meters from the center of the instrument amounted to about 10 percent. In other cases, the point of passage of the axis and the number of particles in the shower were determined according to the ratio of the density of flow of the charged particles in the center of the instrument and at the three points 19 meters from the center, whereby available experimental data on the function of the spatial distribution of the shower particles (Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 31, 1956, 939) was utilized. With this method, the error in the determination of the above-indicated characteristic of the shower amounted to 40 percent.

The absorption of the component of the shower which penetrated the ground was studied with counters located directly under the central part of the instrument in a shaft at depths 8 and 16 meters water equivalent. In constrast to earlier measurements (Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 32, No 3, 1957), on both levels of measurement, there were

detectors consisting of three rows of hodoscopic counters separated by filters (6 centimeters lead.) These detectors afforded the possibility of studying both the energy spectrum of the mu-meson component of the shower and the absorption of the flow of shower particles in a dense substance.

Measurements showed that the energy spectrum of the mu-mesons at a distance equal to or less than 10 meters from the axis of the shower may, for the mu-meson energy range E = 1.5 - 3.5 bev, be expressed approximately in the form $1/E^m$, where m = 0.27 plus-minus 0.06, which is in complete agreement with the earlier work.

An interesting result was obtained in those cases when the bodies of wide atmospheric showers passed through the detector located at a depth of 800 grams per square centimeter, water equivalent [thickness]. The number of cases was predicted under the assumption that the shower has one body and that the cross sectional dimensions of the showers could be neglected -- the cross sectional dimensions of the body being understood as the area of propagation of particles with an energy greater than or approximately $5 \cdot 10^{11}$ electron volts. The number of cases computed was in agreement with those observed for showers caused by elementary particles with energies E_o smaller than $6 \cdot 10^{14}$ electron volts (assuming the energy of an elementary particle E_o to be equal to $2.5 \cdot 10^9 \bar{N}$, where $\bar{N}$, is the total number of charged particles at the level of observation). The number of passages of the bodies of showers through the detector exceeded the expected several times, however, in the case of showers produced by elementary particles with energies greater than $6 \cdot 10^{14}$ electron volts. This can be explained, if it is assumed that in wide atmospheric showers caused by elementary particles with energies greater than $6 \cdot 10^{14}$ electron volts, the cross sectional dimensions of the body, i.e., the areas of concentration of particles of energies greater than or approximately $5 \cdot 10^{11}$ electron volts, are approximately one to 2 meters, which does not contradict the available data (Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 31, 1956, 939) on the spatial distribution of charged particles near the axis of a wide atmospheric shower.

The spectrum of the electron-photon component in the central part of the recorded wide atmospheric showers was examined by means of a large Wilson chamber (described in Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 26, 1955, 209). The location of the Wilson chamber in relation to the hodoscopic counters is shown in an illustration. The energy of the electrons and photons was determined according to the total number of particles in the cascade of the shower which appeared during the passage of electrons and protons through the lead plate of the Wilson chamber. In this way, the spectrum of the electron-photon component in the energy range $2 \cdot 10^8$ - 10^{10} electron volts was measured for different distances from the axis of the shower. If a value of 10^{12} electron volts is assumed for the energy of the π^0-mesons responsible for the formation of the electron-photon component of the recorded showers, the experimentally obtained spectra of the electron-photon components 4 meters from the axis of the shower were, according to the

predictions of the cascade theory, deficient in high-energy electrons and photons. This discrepancy between the experimental and theoretical can be eliminated if it is assumed that the essential role in the formation of the electron-photon component of the shower is played by the π_0-mesons with energies less than or approximately 10^{10} electron volts.

The measurements of the energy flow transported by the active nuclear and electron-photon components of the wide atmospheric showers, and the studies of the structure of the body of the shower, were carried out with 30 cylindrical ionization chambers of two sizes: 12 chambers with a diameter of 18.5 centimeters and a length of 42 centimeters were located in two groups of six each. The remaining 18 chambers had a diameter of 22.5 centimeters and a length of the working portion equal to 96 centimeters. The chambers were filled with chemically pure argon at a pressure of 4 atmospheres.

A radio-engineering apparatus devised by L. N. Korablev was used to measure the amplitude of the electron component of the ionizing collisions in the range $6 \cdot 10^3 - 10^8$ ion pairs, which corresponds to an ionization caused by the passage of $1 - 1.5 \cdot 10^4$ relativistic particles down the center chord of the chamber.

Filters of different substances and varying thickness were placed above the ionization chambers. Measurements were made with lead filters one, 2, 3, 4, 5, 10, 20, 50, and 80 centimeters thick; with iron filters 1.2, 3.5, and 7.5 centimeters thick; aluminum and graphite filters with a total mass of 230 grams per square centimeter; and a more complex filter consisting of 3 centimers of lead placed directly above the chamber and 80 centimeters of graphite covered by 2 centimeters of lead. The use of these filters made possible the measuring of the energy flow carried by the electron-photon component of the shower at different distances from the axis, as well as the determination of the energy of the active nuclear shower particles. The energy of the particles with the highest energy in the body of a wide atmospheric shower with less than 10^5 particles is equal, on the average, to 10 percent of the energy of the electron-photon component of the shower at the level of observation. The remaining nuclear active particles in showers with the above-indicated number of particles were distributed according to the rule $1/E^n$, where E is the energy of the nuclear active particle, and $n = 0.9$ plus-minus 0.2. The energy carried by these particles amounts to 60 percent of the total energy of the shower at the level of observation (after deducting the energy carried by the mu-mesons and the neutrino).

The article gives as an example the recording of the "main" particles under the filter made up of 3 centimeters of lead, 130 grams per square centimeter of graphite and 2 centimeters of lead. The multiplication, in the 3-centimeter layer of lead, of the electron-photon component resulting from nuclear reaction of the high-energy particles in the graphite, made it possible to evaluate the energy of the nuclear-active particle in each

separate case of shower recording. In the given case, the energy of the "main" particle was evaluated according to an ionizing collision equal to 10^{12} electron volts in one of the chambers, which makes up about 15 percent of the total energy of the electron-photon component of the shower at the level of observation.

The bodies of wide atmospheric showers with more than 10^5 particles have a more complex structure. In such showers, in contrast to those with less than 10^5 particles, one single outstanding particle (in respect to energy) is not observed; rather, several nuclear-active particles are detected which are approximately equal to one another in energy. The cross sections of such regions in the observed showers were one to 3 meters. This coincides with the results of observations in a shaft and is also in agreement with earlier hypotheses (Doklady Akademii Nauk SSSR, Vol 111, 1956, 71) on the possibility of a change occurring in the character of the elementary interaction at an energy, of the interaction of the particles, of about $3 \cdot 10^{14}$ electron volts.

The authors express thanks to the large collective made up of associates at the Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR, and students of Moscow State University. Professors N. A. Dobrotin and G. T. Zatsepin are thanked for their advice and for reviewing the results of the experiments. (Moscow, Doklady Akademii Nauk SSSR, Vol 118, No 5, 11 Feb 58, pp 899-902)

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Nets for Radio-Frequency Mass-Spectrometer

An article entitled "networks for Radio-Frequency Mass-Spectrometer" by V. G. Istomin of the Institute for Applied Geophysics, Academy of Sciences USSR (IPG AN SSSR) describes the development of a 7-5 cyclic radio-frequency Bennett type mass-spectrometer in which the cross-woven networks were replaced by unidirectional rows of tungsten wire. The networks were made of 18 micron tungsten wire wound on a special frame with "kovar" rings. Such a networks has a working area with a diameter of 35 millimeters, a mesh of 0.5 millimeters, and transparency of 96 percent. The networks were mounted in such a manner that each successive network would be at an angle of 90° with respect to the preceding one.

The resolving capability of such an instrument was very close to that of the Townsend instrument.

In 1957, several of the 7-5 cyclic mass-spectrometers were built according to the specifications of the institute. The resolving capability of these instruments was improved about 25 percent. Thus it was shown that the use of unidirectional wire networks actually improves the resolving capability of the instrument. (Pribory i Tekhnika Eksperimenta, No 2, Mar-Apr 58, p 111)

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German Star Atlas Published

The Academy Publishing House in Berlin has issued the Atlas of the Star Sky, which was compiled by the great German astromer, Prof Dr Otto Kohl (died 1957) and Gerhardt Fel'zman. A similar manual for astronomers has not been published since the last publication in 1938 of the Schuring-Goetze Star Map. The appearance of this new atlas was received with great interest by the scientific community.

The atlas contains nine polychromatic star maps, color photographs of the Moon, pictures of the Sun with sunspots, and photographs of star groups and comets. On the star maps are stars with a magnitude of up to sixth order, while each subclass, as well as wandering and double stars, are specially noted. The distribution of brightness in the Milky Way is conveyed according to Pannekok, and the position of star groups and nebulae is registered down to approximately the tenth magnitude.

Photographs of the Sun (over-all photographs with spots, granulations, faculae, and also special photographs of spots) which appear in the atlas were made with the Einstein telescope in the Potsdam observatory. The atlas makes quick orientation in a starry sky possible for both scientists and amateur astronomers and is also a valuable training aid for secondary schools. (Nauka i Zhizn', No 5, May 58, p 76)

New Book on Cosmic Radiation

A new book entitled Luchi-razvedchiki (Ray Detective), by G. B. Zhdanov, was recently published by the publishing house "Molodaya Gvardiya."

In the book, the author acquaints his readers with a chronicle of the investigations of cosmic rays and reveals the minute physical problems which inevitably stand before those who encounter this field of science. The book describes Soviet work in this field especially well.

Among the subjects covered by the book are what cosmic rays are, what their particles consist of, how they originate, how the 7 act on striking the Earth, and what does science expect in the future concerning them. (Znaniye-sila, No 4, Apr 58 p 42)

Soviet Ship Ob' Repaired in Chilean Port

According to a radio report from V. Tkachev, first mate, the Soviet diesel-electric ship Ob' was forced to put into the Chilean port of Valparaiso for repairs to its propeller. The ship lost one of its propellor blades while it was making an oceanographic profile under the IGY program between Easter Island and Valparaiso. The accident resulted from damage incurred during operations in the heavy ice of the Antarctic.

The ship and crew were well received. At a press conference Prof V. G. Kort, chief of the Marine Antarctic Expedition, and I. A. Man, captain of the Ob', described the work of the expedition to members of the Chilean press and radio. The Institute of Chilean-Soviet Culture, recently organized in Valparaiso, held a reception in honor of the members of the Soviet Antarctic Expedition.

Lack of dry-dock facilities in Valparaiso forced the Ob' to proceed to the port of Talcahuano.

Leaving Talcahuano after repairs, the Ob' went south toward Drake Strait. (Moscow, Izvestiya, 6 Jun 58)

New Underwater Camera

A new automatic underwater camera has been developed in the Laboratory of Underwater Research of the Scientific Research Institute of Marine Fish Economy and Oceanography by Engr O. A. Sokolov and P. V. Yegorov, mechanic. The camera is enclosed in a shell-like housing together with an impulse flash lamp and a small timer.

The shell, submerged with a trawl, can be launched from the trawl at any depth. By using an electronic relay, the timer can be made to operate at any moment desired, and not necessarily at the time of immersion. The apparatus can make 750 exposures.

Photographs recording the behavior of fish during trawling operations make it possible to determine what changes and improvements may be necessary in trawl designs. (Ogonek, No 21, 1958, p 14)

New Island in Antarctic

The new island recently discovered in the Antarctic by the Third Antarctic Expedition is located at 65-56 S and 99-45 E. The area of the island is 29 square kilometers and the elevation above sea level is 90 meters. In the center of the island is a larger elevation 1.2 kilometers long. The elevated part of the island is covered with granite and gneiss boulders, gravel, and fragments of ancient crystalline rocks. Deposits of sand and pebbles were found at the foot of the elevation. The scientists visiting the island also found several types of lichens. It is assumed that the elevation was freed from ice at a relatively recent time. (Moscow, Trud, 16 Apr 58)

Antarctic Weather Forecasts by Soviets

According to Finnish meteorologists who recently returned from a visit to the USSR, Soviet meteorologists can predict weather in the Antarctic 6 months in advance. The system used by the Soviets is based on the work of Professor Wangenheim [name transliterated from French] of the Soviet Arctic Institute and on observations of the sunspot cycle by meteorologists in Leningrad. (Paris, Le Monde, 7 Jun 58)

Tectonics and Origin of Central Polar Basin

In an article, "Tectonics and the Origin of the Central Polar Basin," D. G. Panov gives a short review of opinions on the tectonics of the Central Arctic and establishes the presence of symmetricalness in the geological structure of the Arctic as regards its ocean basins.

On the basis of newly compiled data, the author propounds a tectonic scheme for the central part of the Arctic. He shows that the formation of the ocean depressions of the Central Polar Basin are the result of a very long process connected with the sinking of heterogeneous structures in the Central Arctic region. This process appeared in the complex undulations of the Mesozoic Period and in the widening and deepening of the ocean depressions in the given area during the Tertiary and Quaternary periods.

Panov offers the hypothesis that since the submerged Lomonosov Ridge has a great effect on the circulation of the Arctic water masses it could also influence the development of Quaternary glaciation in the Arctic (Byulleten' Moskovskogo Obshchestva Ispytateley Prirody, Otdel Geologicheskiy, Vol 32, No 1, 1957, pp 21-37)

Glaciological Expedition in Arctic

The glaciological expedition of V. L. Sukhodrovskiy arrived in the Arctic in August 1957. The expedition settled down to conduct scientific research on top of the G. Sedov glacier located on Ostrov Gukera (Hooker Island), one of the islands of Franz Josef Land. The glaciological observations of this expedition are part of the IGY program.

The summit of the glacier where the expedition is located is called "Kupol Churlyanisa" (Churlyanis cupola). This place has been visited by a number of previous expeditions. During 1947-1949, a glaciological expedition under P. Shumskiy, Doctor of Geographical Sciences, intered here and collected extensive data on the glacier's activity. It is planned for expedition under Sukhodrovskiy to remain at this location for 2 years, i.e. until the beginning of navigation in the summer of 1959. The observations conducted by the expedition will make possible more extensive conclusions and predictions not only for the life of the Sedov glacier or the Churlyanis cupola, but also to a considerable degree for the whole glacial cover of Franz Josef Land.

The ice laboratory was built at a depth of 10 meters entirely within the glacier. It has a vaulted ice ceiling, ice walls, and even ice shelves and niches. On one side is a storage place of snow and ice core samples; another room is equipped for working with instruments, including a microscope, and scales. A narrow staircase with 40 steps and a rope railing leads down to the laboratory from the living quarters.

Samples of firn are examined in the ice laboratory with a microscope and light filters to study the process of formation of ice.

All the different properties of ice are studied by the expedition. Therefore, a large number of various instruments are being used: some record the temperature and moisture of the air and the speed of wind; others record the accumulation of snow on the surface and the density of snow; semiconducting thermometers transmit signals on the temperature of ice at different depths

In the fall of 1957, the glaciologists placed over 100 rods on the surface of the Sedov glacier. This spring, with the beginning of intensive glacier activity, it will be possible to determine how much the glacier has advanced toward the sea.

The members of the expedition live in a log cabin on top of the glacier. This cabin had been built by a previous glaciological expedition 5 or 6 years ago and had gradually sunk so deep into the ice that only the top of the chimney remained visible. The new expedition dug the cabin out of the ice, dried it out, and made it fit for living.

The expedition has another small wooden hut, a canvas tent for batteries, a small electric power station, and a storage place. At the summit of the glacier, a flagpole flying a red marker flag is erected.

Two members of the expedition, M. G. Grosval'd and A. S. Zimnikov, are continuously present in a separate hut on the slope of the glacier, on the way to the summit. A few steps from this hut is the meteorological observation area, where instruments have to be checked at regular intervals, in any kind of weather. The other members of the expedition party live in the house at the summit. These include V. Tolmachev, mechanic; A. Krenke, scientist; V. Markin, laboratory worker; A. Karasev, cook; and I. Parkhomenko, an expert in many jobs. There are also two girls, Lyubov' Voronina, meteorologist, and Tat'yana Psareva, laboratory worker; they live together in a separate room. Tat'yana Psareva works in the ice laboratory inside the glacier. (Moscow, Izvestiya, 11 Jun 58)

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